

PHYSICAL CONDITIONS OF THE WATERSHED

Chapter 1

Location and Overview of the Area

Butte Creek originates in the Jonesville Basin, Lassen National Forest, on the western slope of the Sierra Nevada Mountains, at an elevation of 7,087 feet. The upper watershed area comprises approximately 140 square miles and drains from the northeast portion of Butte County. Butte Creek enters the Sacramento Valley southeast of Chico and meanders in a southwesterly direction to the initial point of entry into the Sacramento River at Butte Slough. A second point of entry into the Sacramento River is through the Sutter Bypass and Sacramento Slough (see Map Appendix, Base Map DEM).

Several small tributaries converge in the Butte Meadows basin, an area characterized by a series of wide meadows and repeating series of pools and riffles. Pine, cedar, and fir dominate the upper portion of the area, whereas the predominant riparian vegetation types in the meadow areas are alder and willow. Butte Creek flows from the Butte Meadows area approximately 25 miles through a steep canyon to the point where it enters the valley floor near Chico. Numerous small tributaries and springs enter the creek in the canyon area. Deep, shaded pools are interspersed throughout the upper section of the canyon above Centerville, whereas the area below has a shallower gradient and riparian canopy of alder, oak, sycamore and willow.

Flows from the West Branch of the Feather River, diverted by Pacific Gas and Electric Company (PG&E) for power generation, enter Butte Creek via the Toadtown Canal at the DeSabra Powerhouse. Two existing dams were modified by PG&E in 1917 to divert water from Butte Creek for power generation. Another, the diversion for the Forks of Butte Hydroelectric Project, was built by the Energy Growth Partnership I in the 1980s. The lowermost structure, the Centerville Diversion Dam, located immediately below the DeSabra Powerhouse, is generally considered to be the upper limit of anadromous fish migration. Anecdotal reports suggest that under extremely high flows, steelhead have been observed traversing this dam. Small impoundments in the watershed, including Magalia Reservoir, Paradise Lake, and DeSabra Reservoir, store a combined 14.7 thousand acre-feet.

The upper watershed area above the valley floor comprises primarily private land holdings, with some national forest lands at the extreme upstream portion. Urban development in the upper watershed area of the mainstem of Butte Creek has been limited, although Little Butte Creek is regulated by two dams that provide domestic water for the town of Paradise. The Paradise area is being developed and is currently undergoing a severe water shortage. Currently, except under high winter flows, Little Butte Creek makes only a minimal contribution to the flows of Butte Creek. Increased infill development, primarily residential, is occurring in the lower canyon and along Butte Creek as far as Durham.

Upper Watershed: Butte Meadows

Butte Creek originates from snow and rain that fall on the western face of the Sierra Nevada. It is formed by four small streams that flow into the Jonesville Basin in Lassen National Forest in an area dominated by species of pine, cedar, and fir. The creek gathers flow as it drops into Butte Meadows Basin. Softwoods cover the hills around the creek while alder and willows comprise much of the riparian overstory. Butte Creek flows through a series of wide meadows and is characterized by repeating sequences of pools riffles. Riffle substrate is cobbles and gravel. The stream flows all year, but peaks in streamflow occur during storms and spring

runoff. Stream temperatures remain cool all year and trout is the dominant species of fish (Leach and Van Woert, 1968).

Upper Watershed: Butte Creek Canyon

Butte Creek cascades from the mountains to the valley through steep canyons. Pine and fir dominate the flora at the head of the canyons, but as the stream reaches the valley floor oaks and willows are more common. PG&E owns two dams in the canyon which are utilized for hydroelectric generation. The first dam, Butte Creek Head Dam, diverts all but 17 cubic feet per second (cfs) of Butte Creek for hydropower generation during wet and normal years and all but 7 cfs during dry years. Tributaries add flow to Butte Creek in the canyon. The second dam, Centerville Head Dam, diverts all but 40 cfs during wet and normal years and 10 cfs in dry years. Water imported from the West Branch of the Feather River which passes through the Centerville canal returns to the creek at Centerville Powerhouse. The stream in the canyon between and below the dams is characterized by deep pools and steep rocky banks. The stream gradient is steep through the canyon (Hansen et al., 1940).

Salmon and steelhead migrated far into the canyons prior to construction of the dams in 1917. Steelhead probably went as far as Butte Meadows (Flint and Meyer, 1977). They are now restricted to the lower reaches of the canyon and tributaries such as Dry Creek (Brown, 1992b). Salmon now spend their summers between a natural barrier about 1 mile below Centerville Head Dam and the Covered Bridge. Most gradually swim up to the barrier during summer. Some spawn near their holding pools, but many drop downstream to areas richer in suitable gravel. Young salmon rear in the canyon below Centerville Head Dam for up to one year. Summer flows of 40 cfs generally keep water temperature below 68°F in the reach (Kimmerer and Carpenter, 1989). Water temperature often exceeds 76°F in the canyon between Butte Creek Head Dam and Centerville Head Dam in July and August. With improved flows and new fish ladders, fall run salmon are now moving into this section in the fall to spawn.

Lower Watershed: Valley Section

Butte Creek leaves the canyon and flows through a portion of the Sacramento Valley near Chico. Oaks, cottonwoods, and willows are common along the banks of the upper reaches in this section (CDFG, 1974). The creek is bordered by levees in most of the valley reach. Four dams and numerous diversions in the valley section remove water to irrigate rice fields and orchards (McGill, 1987). The upstream-most diversion, Parrott-Phelan, takes water all year (winter diversions are small and are made with the dam boards out), but most divert in April through September. Fall run chinook salmon spawn in this reach between Highway 99 crossing and Western Canal crossing in October and November. Adult spring run chinook salmon pass through this reach from February to June. Juvenile salmon from both races rear here in late winter though late spring on their way to the Pacific Ocean.

Lower Watershed: Butte Basin

Butte Creek water passes through the Butte Basin, Butte Sink, Butte Slough, and the Sutter Bypass before it joins the Sacramento River. Creek water flows through twin channels, the East and West borrow pits all year and Butte Slough Outfall during flood flows in the fall, winter, and spring. The borrow pits are regular, excavated channels on either side of Sutter Bypass. The creek gains flow here through the return of irrigation water. Gates on Willow Slough and the East-West borrow pit diversion structure are used to control water levels in the East borrow pit (Slebodnick, 1976). Dams also impound and divert water for wildlife and agricultural uses. The dams include: Sanborn Slough, White Mallard Dam, East-West Diversion weir, and weirs number 1 through 5. Willows are the dominant riparian plant species. Salmon and steelhead rear in

these waters in spring and early summer. High water temperatures 70° - 85°F in late spring and summer are lethal to salmon and steelhead in this reach.